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RADIO IMAGE OF THE MOON IN THE 8-MILLIMETER RANGE

- USSR -

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This communication concerns the two-dimensional distribution of radio brightness of the moon in the 8-mm range as observed by the 22 meter radiotelescope of the Physical Institute. The phase character of the distribution is disclosed; it follows with a shift of about 30°, the changing phases of the moon. A darkening of the limb was also observed.

From September to November 1959 systematic observation of the two-dimensional distribution of temperature brightness of heat radiation from the moon in the 8 mm wave range was carried out using the 22 meter radio telescope of the Physical Institute imeni P. N. Lebedev, AS USSR. Unlike all other known observations of moon radiation, including those in the same range, /1, 2/ where average data "smeared" over the disc temperatures were obtained, our observations, because of the high resolving power of our radiotelescope directional diagram at half-power level of about 2' X 2' yielded values of temperature brightness for particular areas on the lunar disk. Radio images of the moon were recorded with successive passages of the moon along the aximuth or height with simultaneous following or slow passage of another coordinate. Preliminary processing of the data obtained (uncorrected for some averaging due to the final width of the directional diagram of the radiotelescope antenna) permits the conclusions that there is a noticeable dependence of the radio brightness distribution over the lunar disk on the lunar phase.

The area of maximum radio brightness moves systematically over the visible lunar disk in accordance with its change of phase. There is a delay of the phase of the observed distribution with reference to the shift of the terminator on the visible disk. In particular, the distribution is found to be symmetrical about the axis crossing the

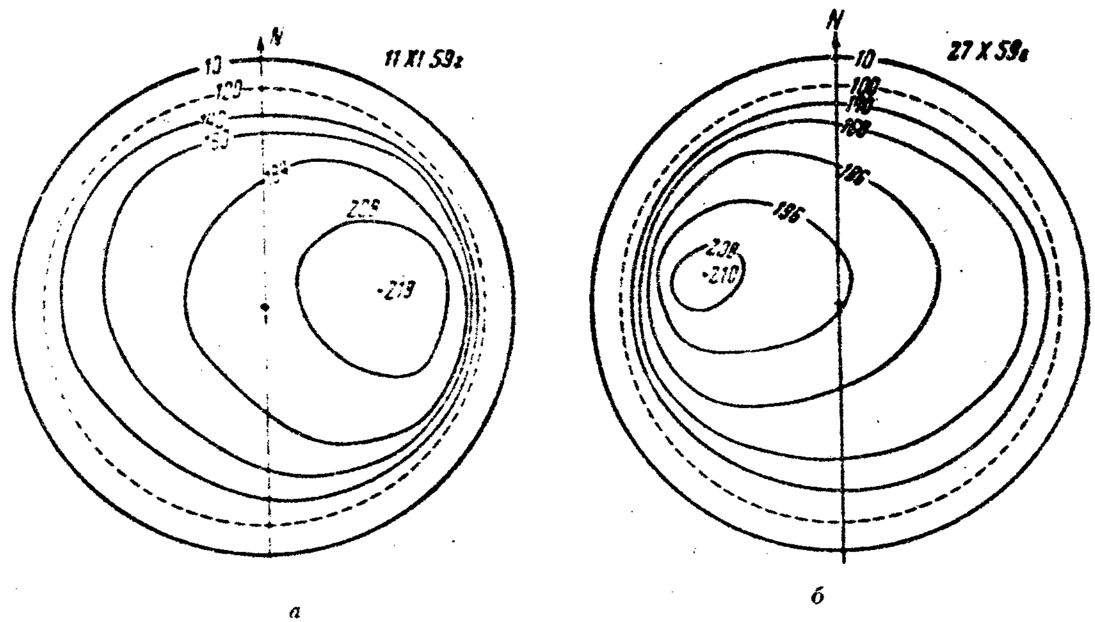

Fig. 1. Temperature distribution uncorrected for the diagram of the antenna. Dashed line shows the lunar disk.

center of the disk 2 to 3 days after full - or new moon, which corresponds to a phase delay of about 30°. This symmetry is not observed during full - or new moon. The "visible" distribution becomes substantially asymmetric after the beginning of the first quarter (Fig. 1a) and during the third quarter (Fig. 1b). In the first case, the western part of the disk is the brightest, while in the second the eastern part is brightest. The distribution at times equi-distant in phase from the time of symmetric distribution has a different character: upon the appearance of the subsolar point from beyond the western edge, an abruptly asymmetric distribution is established; after setting, the distribution is more uniform. The temperature brightness of separate areas on the disk changes in the course of lunation. In particular, the temperature of the center of the disk changes noticeably: Maximum and minimum temperatures differ from the average by above 40%. The maximum temperature at the center of the disk occurs at 30° after full moon; subsequently the temperature begins to decrease, rapidly at first, and then more slowly, continuing up to 50° after the new moon. Then it begins to increase rapidly to its maximum. The above-mentioned peculiarities in the character of distribution and time variation of temperature brightness are associated with the presence of noticeable higher harmonics in the resolution of the distribution.

Along with a phase variation of the radio brightness distribution a decrease of the radio brightness from center to periphery is revealed. This darkening of the lunar limb /3/ results in the area of maximum brightness, the brightness temperature of which shifts during the course of lunation. When this area, following the subsolar point, nears the edge of the disk, the temperature of the area, due to a darkening of the limb, becomes substantially lower than that near the center of the disk.

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